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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/698,546

11/03/2003

Naokatsu Ikegami

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02/13/2009

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EXAMINER

CHEN, KIN CHAN

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

02/13/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/698,546

Applicant(s)

IKEGAMI, NAOKATSU

Examiner

Kin-Chan Chen

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SE/US)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 16, 2008 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 12-17 are rejected under 35 U.S.C. 103(a) as obvious over Watatani (US 6,153,511) in view of Chen et al. (US 6,352,938) as evidenced by

Sugahara et al. (US 5,989,998) and Demmin et al. (US 6,635,185; col.7, lines 15-25 and Tables).

In a method for fabricating a semiconductor device, Watatani teaches that a low-dielectric, organic insulating layer (e.g., organic SOG) may be formed over an interconnect layer. A contact hole may be formed in an organic insulating layer (e.g., organic SOG) so as to expose the interconnect layer using a patterned resist layer formed over the organic insulating layer as a mask. The patterned resist layer may be ashed (Figs. 5A-5I; col. 7, lines 7-11). Watatani teaches removing photoresist by ashing. Watatani is not particular about the etchant. In a method for stripping photoresist, Chen (abstract; col. 4, lines 8-25) teaches that a mixed gas consisting of nitrogen, oxygen and hydrogen (such as $\text{N}_2\text{H}_2 + \text{O}_2$, same as that disclosed in applicant's claims) may be used for ashing to strip the photoresist from a low dielectric constant (low-k) dielectric layer. The disclosure of Chen is not limited to any particular low dielectric material, therefore, making commonly used low dielectric organic SOG insulating layer obvious. Hence, it would have been obvious to one with ordinary skill in the art to use oxygen and a mixed gas containing nitrogen and hydrogen (such as N_2H_2) as taught by Chen in the process of Watatani for ashing in order to effectively remove the photoresist from a low-k dielectric layer.

The claimed invention differs from the combined prior art by specifying forming a protective film on a surface of the contact hole during the ashing wherein the protective film is formed by reacting the organic insulating layer (e.g., organic SOG) with the nitrogen. However, because the same materials are used with the same process, it is

expected that the method of the combined prior art would possess the claimed characteristic and properties, such as forming the protective by reacting the organic insulating layer with the nitrogen.

Claim 15 differ from the prior art by specifying conventional materials and process (such as forming organic SOG by adding alkyl group to a silicon oxide) to the art of semiconductor device fabrication. A person having ordinary skill in the art would have found it obvious to modify the combined prior art by adding any of same conventional materials and process to same in order to form the organic SOG with a reasonable expectation of success, see Sugahara et al. (US 5,989,998) in the record as evidence.

The above-cited claims differ from the prior art by specifying various processing parameters (such as pressure and temperature in claims 13,16, and 17) and composition (such as a ratio of O_2 to N_2H_2 in claims 12 and 14). However, same were known to be result-effective variables and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. **In the absence of showing criticality or new, unexpected results**, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and composition) to obtain optimal result with a reasonable expectation of success. The workable or optimum ranges of flow rates of gas (a ratio of O_2 to N_2H_2) can be determined by routine experimentation. Chen discloses that different amounts of O_2 and N_2H_2 (such as col. 4, lines 17-19) may be

employed, thus evidencing the amounts of O_2 and N_2H_2 are result effective variables and commonly determined by routine experiment. See also Demmin in the record as evidence. Demmin discloses that one skilled in the art can vary type of plasma etching, composition, flow rate, temperature, pressure, power, time and bias accordingly to etch a desired material.

The amounts of an ingredient would have been well within the ordinary skill in the art, absent a showing of criticality. See In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). In re Woodruff, 16USPQ2d 1934,1936 (Fed. Cir.1990); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809; In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II. The burden is on the applicant to establish with objective evidence that the change is critical.

Response to Arguments

4. Applicant's arguments filed December 16, 2008 have been fully considered but they are not persuasive.

Applicant has argued that Chen does not teach a ratio of O_2 to N_2H_2 is 90:10 nor does Chen teach the claimed temperature and pressure. It is not persuasive. As has been stated in the office action, same were known to be result-effective variables and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. **In the absence of showing criticality or new, unexpected results**, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and

composition) to obtain optimal result with a reasonable expectation of success. Chen discloses that different amounts of O_2 and N_2H_2 (such as col. 4, lines 17-19) may be employed, thus evidencing the amounts of O_2 and N_2H_2 are result effective variables and commonly determined by routine experiment. See also Demmin in the record as evidence. Demmin discloses that one skilled in the art can vary type of plasma etching, composition, flow rate, temperature, pressure, power, time and bias accordingly to etch a desired material. See also the case law cited above.

The examiner would like to remind applicant that mere reiteration of claim recitation (e.g., the prior art does not teach the process conditions or the ratio of flow rate) does not constitute an argument within the meaning of 37 CFR 1.192(c) (7)(8). The argument needs to specify the errors in the rejection and the specific limitations in the rejected claims which are not described in the prior art relied upon in the rejection, **and an explanation how such limitations render the claimed subject matter unobvious over the prior art**, for example, showing the criticality of the claimed range by showing the claimed range **achieving unexpected results relative to outside the claimed range.**

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sugahara et al. (US 5,989,998; col. 3, lines 25-42) discloses that organic SOG may be formed by adding alkyl group to a silicon oxide. Demmin et al. (US 6,635,185; col.7, lines 15-25 and Tables) discloses that one skilled in the art can vary

type of plasma etching, composition, flow rate, temperature, pressure, power, time and bias accordingly to etch a desired material.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kin-Chan Chen/
Primary Examiner, Art Unit 1792

February 11, 2009